

Ultrasonic waves regulates antioxidant defense and gluconeogenesis to improve germination from naturally aged soybean seeds

Table S1. The effect of ultrasonic waves treatment (UWT) on soybean seeds germination and seeding establishment.

Treatment	Frequency (kHz)	Priming time (min)	Germination rate (%)
Control-1	0	10	70.25 ± 4.257 d*
Control-2	0	15	71.75 ± 2.331 c
Control-3	0	20	68.50 ± 4.256 e
UWT-1	20	10	69.25 ± 3.451 de
UWT-2	20	15	74.75 ± 3.124 b
UWT-3	20	20	64.00 ± 5.124 g
UWT-4	40	10	75.50 ± 3.127 b
UWT-5	40	15	81.75 ± 4.264 a
UWT-6	40	20	72.00 ± 3.594 c
UWT-7	60	10	64.50 ± 4.254 g
UWT-8	60	15	65.75 ± 3.295 f
UWT-9	60	20	60.00 ± 4.551 h

*Values followed by a different letter within a column are significantly different at the 0.05 probability level. Seeds stored for 12 month were used for test. Values are means of four replicates.

Table S2. Primers used in qRT-PCR analysis of genes expression

Gene name	Primer sequence	
	Forward primer	Reverse primer
<i>GmTubulin</i>	AACCTCCTCCTCATCGTACT	GACAGCATCAGCCATGTTCA
<i>GmSOD1</i>	TTGCTGGTCTTAAGCCTGGT	GGCAACCATTGGTAGTGTCC
<i>GmSOD3</i>	TCCAACCACCGTAACTGGAT	CAAGGCATGGACATGGAAA
<i>GmCAT1</i>	CCCAGGACCTTTACGATTCA	GGATGTAGAGTTTCCACTCAGGA
<i>GmAPX2</i>	AAGGGTTCTGACCATTGA	AAGGTAGCTGAAGGAGGC

<i>GmAPX3</i>	AAAAGTTTCATACGCAGAC	ATACCCATACGAGAA
<i>GmALDH1</i>	CATTCCACTTACCGACAC	TCTCCCTCACTAACTCTTG
<i>GmPCK1</i>	ACCTAAGTTACATGGTGCAGTG	CGTGCTCTGTTCCGTTCCCTT
<i>GmFBPase1</i>	GTTCTGGAGTTAGGTGCATGG	TTCTCTTCTTTGTCCCAGTGGT
<i>GmFBPase2</i>	GGGGGTTCTGGAGTTAGGTG	TCTTCTTTGTCCCAGTGGTTG
<i>GmSUSY3</i>	TTGATCCCAAGTTCAACATAGC	TTGACTTTGTCTGTGTAAGGGAAA
<i>GmSPP1</i>	CAATGCCCAAGAGGAACTGT	GCATGAAGAATCTTGGGGTTA
<i>GmPPase2</i>	CAACCTTGCCATGACTTCAA	CACATGTTTGGAGGGCATAA
<i>GmINV1</i>	TGAAGGGGAAATTGTCAAGAA	CTTGCCCTGGACTGTAGCA
<i>GmINV3</i>	GATGGTCAGGAGTGGCAGAT	GGTAGGACCAAGGCGTGTT

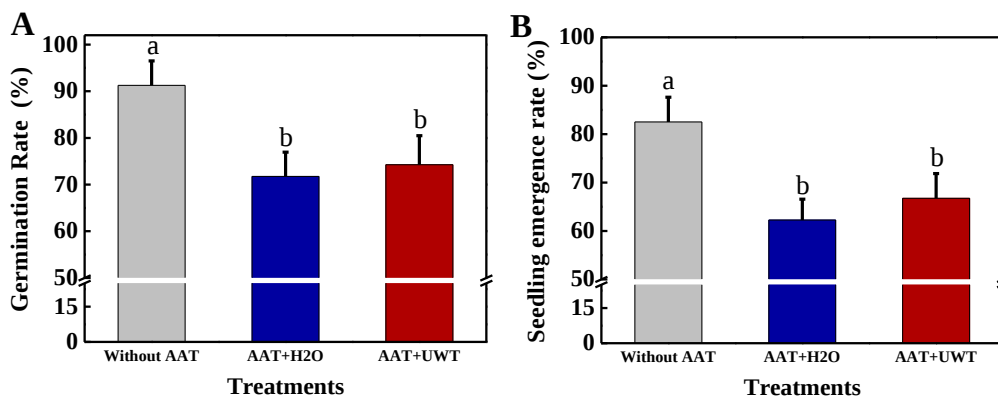


Fig.S1. UWT made no effect on germination (A) and seedling emergence (B) of artificially-aged soybean seeds

Without AAT: fresh seeds without accelerated aging test (AAT); AAT + H₂O: AAT seeds with H₂O; AAT + UWT: AAT seeds with ultrasonic waves treatment (UWT). The diverse lowercase(s) on top of the bars were indicative of significant differences ($p < 0.01$, Lsd) across treatments.